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RESEARCH ARTICLE

# Machine Vision Based Congregation Management System Using myRIO

R. Prashanna Rangan*, K. Sethuramalingam, and P. Sairam Santhosh

*UG Scholar, Department of Mechatronics Engineering, Kongu Engineering College, Erode 638060, India*

In the present times, taking of attendance is mandatory not only in educational institutions, but also in MNC firms so as to ensure the current state of the respective persons. In many companies, a person's salary is provided based on his working hours and hence, it is an inevitable work that has to be taken out to check the individual's current status. With the advancement of technology, human life has become more sophisticated. This paper aims in developing a smart sensor based approach for taking the attendance. This project utilizes a CMOS camera, by which the face of every individual is recognized in comparison to the database and attendance is taken in seconds. This work can be very useful in taking the attendance more precisely and at a rate much faster than the other. The accuracy is quite high when compared with other technologies, as it recognizes the whole face of the individual and hence there is no possibility for making a false attendance.

**Keywords:** LabVIEW, Facial Recognition, Template Matching, myRIO, Automated Attendance, Digital Image Processing, Web Camera.

## 1. INTRODUCTION

### 1.1. Motivation for the Project

In the recent years, taking of attendance has become mandatory not only in educational institutions, but also in companies, so as to ensure whether the respective persons are doing their duty properly. As it is a vital aspect, by which a person gets his salary in a firm, it is important to take proper attendance. The conventional method of taking the attendance consists of a note book, where there is a list of all the members belonging to that specific area. A person takes the responsibility to readout all the names and marks with respect to the presence of the individual as present or absent. But, practically it is impossible to check for each and every persons, when there is a huge stack of crowd and there is also a possibility of false attendance. Hence it is mandatory to rev up the system with the modern equipments.

### 1.2. Existing Technology

The existing technologies either used a RFID (Radio Frequency Identity) tag or they used a finger print system, Retinal Scan or Voice recognition systems to detect the persons and mark the attendance. They has its own advantages and disadvantages.

Reference [1] explains the usage of RFID based attendance management system, which makes use of a RFID reader and RFID based ID cards, distributed to all students. Similar to the above said system, Ref. [2] also consists of RFID readers and tags, in addition to it, setup of an Infrared based motion sensor to take up the counts of the students who entered the class and it compares the value with the RFID read values to get the actual count. It sends the alert message to the lecturer as well as to the management of the institution. The prototype, as explained by Ref. [3] states the usage of same RFID based attendance system, which further utilizes the usage of a JAVA application at the backend to manage the attendance.

System[4] made use of the Digital Image Processing technique to identify the faces of the individual and marked attendance based on the time they sat inside. It made use of algorithms to search and compare each and every faces inside the room. It showed a 78% accuracy rate. System[5] is similar to the system[4] in many aspects. In the work done in Ref. [6] overcomes the disadvantage of Ref. [4] by taking a short video clip of the classroom continuously and marking the attendance. It uses various algorithms to improve the accuracy rate.

### 1.3. Demerits of Existing Technologies

Biometric systems ensures that none other than the person can mark their attendance, but it lacked when the persons gets himself wounded on the respected finger. In the same way when the person forgets to take his RFID tag or if it is lost the person won't be able to get his/her attendance.

*Author to whom correspondence should be addressed.

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The biometric and RFID detectors can also occasionally fails which also leads to mismatch of attendance. The RFID tags also has another disadvantage that, there is a possibility for misleading of attendance by taking someone's ID's. Hence many of the above said technologies proved to be not sufficient to work efficiently under these circumstances.

Since the methods[1–3] makes use of RFID tags to identify the individuals, it proves to be insufficient and time consuming process to mark attendance. Infrared based motion sensor has also a possibility of making a double count or leave a count, when two or more persons enters simultaneously.

Though the system[4] proved to be useful, it has many complex codings and used complex algorithms to match the faces. It made use of a camera, only inside the class room. The camera captures the images of all present inside the lecture room and marks the attendance. But this technology is not suited for all the times, say for an example if a person leans down, he will eventually be marked absent. System[5] is similar to the system[4] in many aspects. It made used of the same algorithms to train the faces and compare them with the real time acquired image. System[6] creates a database, in which the attendance data will be available to all the authorities, but is non-changeable. The created database is also a size-consuming one. The database is tough to create, as it has many complex codings and algorithms. Hence if any problem occurs, it is not very easy to find and solve the errors.

### 1.4. Proposed System

In common, all the above said technologies used a textual-based programming language and utilized complex algorithms to detect the faces and mark the attendance. Hence to overcome these kind of limitations, this paper proposes a technology, which utilizes graphical way of programming, which eliminates the usage of algorithms.

In the proposed method, the attendance is taken with the aid of a pair of cameras. As soon as the person's face is recognized by the camera, the image is compared with the database and if it matches he/she gets a present in their attendance for the hour. This technology is very useful to avoid fake attendance and its accuracy is quite high compared to other technologies.

The proposed method finds to be useful not only to Educational Institutions, but also to the Industries and Software Firms, who takes attendance regularly to have an eye on their employees.

## 2. COMPONENTS USED AND ITS WORKING

### 2.1. LabVIEW Workbench

LabVIEW is a platform, which has the Graphical User Interface. The programs made here are Graphical oriented and there is no text-based programming. It eliminates the usage of the tough and complex algorithms. It consists of a front panel and a block diagram, as shown in Figure 1. The front panel resembles the industrial panel cluster and hence the name. Block diagram is the area in which the logical programming is made by hot-wiring method. There are many hard-wares that can be linked with LabVIEW and it provides a more easy solution to complex problems.

**Fig. 1.** LabVIEW front panel and block diagram.

### 2.2. NI myRIO

myRIO, as shown in Figure 2 is a stand-alone hardware developed by National Instruments.

The myRIO-1900 is a tool which can be used to implement multiple design concepts with one reconfigurable I/O (RIO) device, as shown in Figures 3 and 4.

Featuring I/O on both sides of the device in the form of MXP and MSP connectors, it includes 10 analog inputs, six analog outputs, 40 digital I/O lines, WiFi, LEDs, a push button, an onboard accelerometer, a Xilinx FPGA, and a dual-core ARM Cortex-A9 processor. It can be programmed by either LabVIEW or C. This onboard WiFi enabled device helps in developing remote embedded applications.

### 2.3. USB Web Cam

A USB web cam is as shown in the Figure 5. The USB web cam is used as an eye to monitor the class room. The True-Color technology of this webcam controls the amount of exposure for bright, colorful pictures. With 360-degree

**Fig. 2.** NI myRIO 1900.

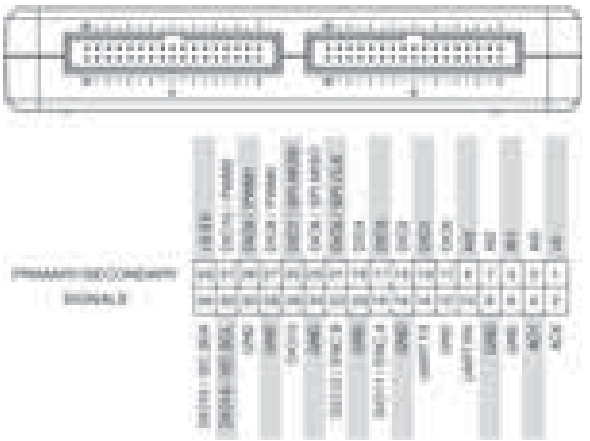

**Fig. 3.** NI myRIO MXP connections.

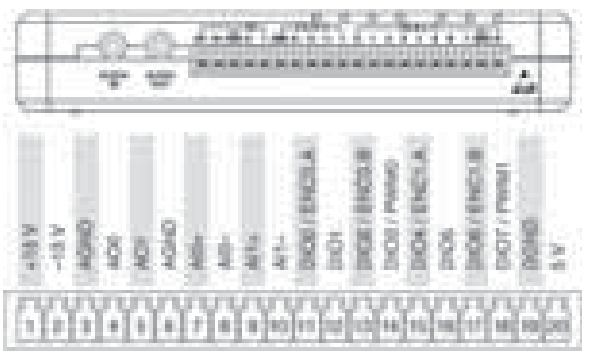

**Fig. 4.** NI myRIO MSP connections.

**Fig. 5.** USB web cam.

lens rotation, this webcam provides all-around view for complete coverage.

## 3. WORKING

In these recent years, taking of attendance has become mandatory due to lack of safety aspects and increased malpractices in the company has become a major threat and is the reason behind the arise of many problems. Hence it is mandatory to check the current status of each and every individual that work for the specific firm/studies in the specific institution and to ensure their presence or absence. The software is first trained by using the NI Vision assist, as shown in Figure 6. The images are logged to a specific location in the local disk of the computer so that in case of a security breach, the intruder's face can be acquired with ease. It is as shown in the Figure 7. Template matching algorithm is as shown in Figure 8. The simulation is made first using the webcam connected to the LabVIEW PC and the results are acquired as shown in the Figure 9. The camera is controlled with the help of an NI myRIO-1900 controller, as illustrated in Figure 10. As soon as the camera finds a person on the floor it captures his/her image and compares it with the pre stored database images for that specific person. In this project Digital Image Processing plays a vital role in scanning each and every person, who may cross the floor with the help of a CCTV camera. The reason digital image processing has been used is that it has the ability to categorize the objects.

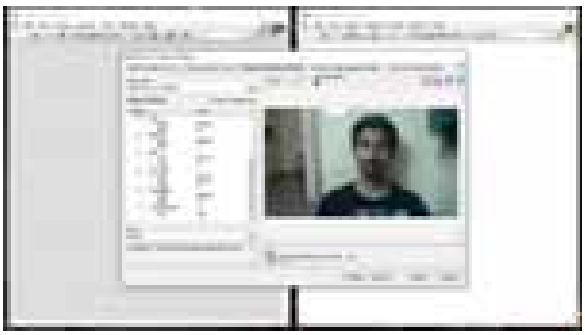

**Fig. 6.** Training the software.

A camera is placed at the entrance of the room. When a person enters the room, his face is captured and gets compared with the database. If the image suits with the database, his/her current status will be marked accordingly and if it doesn't suits with the pre stored data, the captured image is forwarded to the security head stating that there's a security breach and some strangers have entered the firm/institution.

**Fig. 7.** Logging the images.

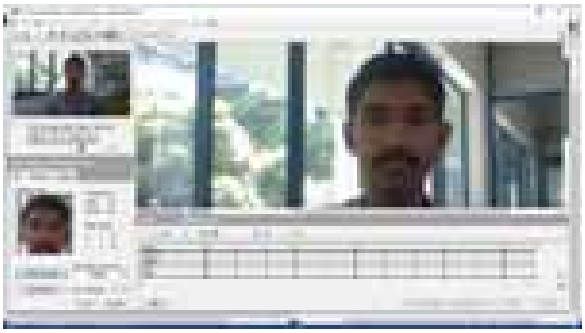

**Fig. 8.** Template matching.

**Fig. 9.** Working simulation.

**Fig. 10.** Working prototype.

Another camera is placed inside the room, which monitors each and every individual's state and if anyone goes out of the room it changes that particular person's current status for that hour, after a time interval of 10 minutes.

This process provides a two-way checking system for the persons and ensures safety by intimating the security officials whenever an unknown person is found.

## 4. FEASIBILITY STUDY

The feasibility study is the study of factors influencing the success of the product, for the purpose of resource determination. Providing the solution for the project is more possible in an economic way. As it involves only one time investment for the components and it costs around Rs. 80,000. Hence it is economically feasible for any firm for these applications. The system is also operationally feasible, as it has the ease of user interface. The system uses simple components which are readily available in the market and it is easy to work with them. Hence the system also finds to be technically feasible.

## 5. MERITS AND DEMERITS IN IMPLEMENTING THE TECHNOLOGY

### 5.1. Merits

- Reliable and cost efficient.
- Checking of persons in a comparably easier and safer way.
- The automated attendance counter technology provides easy way to check for persons and counts efficiently in areas where there is a dense population.
- High levels of accuracy regarding the attendance of a person is ensured.
- Promotes greener solution and is a part of smart city concept.
- Reduces probability of damage to the instruments.

### 5.2. Demerits

- Accuracy in finding the faces of persons in high dust environment depends mainly on light visibility available in the room.
- The camera may occasionally fail and hence faulty signals could be sent to the microcontroller board.

## 6. FUTURE SCOPE

The same setup with a little further modification can be used for industries. The template matching algorithm proved to be useful for object tracking and comparison in various manufacturing industries. Especially in production areas, which requires very high accuracy and ease of usage can implement this technology.

## 7. CONCLUSION

It will be a great achievement when a camera automatically takes attendance with high degree of reliability and accuracy. If the automated attendance counter technology exists in future, then there might not be a chance for false attendance to persons and the time required will be extremely reduced.

If it does not exist, then the automated systems will become a daydream and go in a path, which will be of many problems, including high installation and maintenance costs for any other technology similar to this. Moreover, there will be no assurance for cent percent accuracy. The main motive of this project is to detect and recognize the person and to provide attendance to the persons at a rate faster than any other.

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